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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/824,225	04/14/2004	Dieter Ritter	P04,0101	6358

7590 06/15/2006

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EXAMINER	
ARTMAN, THOMAS R	

ART UNIT	PAPER NUMBER
2882	

DATE MAILED: 06/15/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

H·B

Office Action Summary	Application No.	Applicant(s)	
	10/824,225	RITTER, DIETER	
	Examiner	Art Unit	
	Thomas R. Artman	2882	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 March 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-12* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-12* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *19 August 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-12 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Specifically, the term "3D height" is unclear. "3D" means "three dimensions" or "three-dimensional", where "height" is a one-dimensional entity. The term appears to be contradictory, and therefore, the skilled artisan is unable to determine the meets and bounds of the claim.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1 and 7 are rejected under 35 U.S.C. 102(e) as being anticipated by Stierstorfer (US 6,574,296 B2).

Regarding both claims, Stierstorfer discloses an apparatus and method (FIGURE), including:

a) an X-ray imaging system having a carrier support 5 upon which is mounted an X-ray source 1 and radiation detector 4 allowing an examination subject 3 to be disposed between the X-ray source and the radiation detector,

b) a supporting arrangement for the carrier support ("holding device" not shown) for moving the carrier support relative to the examination subject for acquiring a series of 2D projections of the examination subject with the X-ray source and radiation detector, and

c) an optical 3D sensor 15 mounted to the carrier support, where

d) the optical 3D sensor acquires a 3D image dataset, while the carrier support is moving, that represents at least a portion of a surface of the examination subject (col.2, lines 20-46).

The applied reference has a common assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 2-5 and 8-11 are rejected under 35 U.S.C. 103(a) as being obvious over Stierstorfer.

With respect to all of the above claims, Stierstorfer does not specifically disclose a C-arm as the carrier support. Stierstorfer shows a typical annular CT gantry.

However, it is known in the art that C-arm carrier supports are common variants of X-ray CT carrier supports that move circumferentially and/or angularly in order to acquire a sufficient CT dataset. C-arms are commonly used in smaller, confined spaces or during surgical procedures where the surgeon and attendants need to be close to the patient while X-rays are being taken.

It would have been obvious to one of ordinary skill in the art at the time the invention was made for Stierstorfer to use a C-arm carrier support rather than an annular gantry for improved versatility and compactness as is known in the art.

Further with respect to claims 5 and 11, CT devices in general, and particularly that of Stierstorfer, have isocentric geometries.

Claims 6 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stierstorfer, as applied to claims 1 and 7 above, in view of Asahina (US 5,539,798).

With respect to both claims, Stierstorfer does not specifically disclose the combination of the optical image dataset and the X-ray images by either fusion or superimposing. Stierstorfer only teaches that the optical dataset be assigned to corresponding X-ray image data of the same region of the patient (col.2, lines 36-46).

Asahina teaches an X-ray imaging device that superimposes optical datasets of the surface of the patient with the corresponding X-ray images of the region (Figs.16 and 17A-17C). In this way, accurate positioning of the patient is easily achieved, either automatically or visually by an operator, when images of a body region need to be repeated after a medical procedure is performed (or after a period of time has passed) on the same region (col.14, line 25 through col.15, line 4).

It would have been obvious to one of ordinary skill in the art at the time the invention was made for Stierstorfer to superimpose the optical image dataset with the X-ray image dataset as taught by Asahina in order to quickly and accurately reposition the patient in the imaging system for subsequent imaging of a given region of interest.

The applied reference has a common assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art only under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 103(a) might be overcome by: (1) a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not an invention "by another"; (2) a showing of a date of

invention for the claimed subject matter of the application which corresponds to subject matter disclosed but not claimed in the reference, prior to the effective U.S. filing date of the reference under 37 CFR 1.131; or (3) an oath or declaration under 37 CFR 1.130 stating that the application and reference are currently owned by the same party and that the inventor named in the application is the prior inventor under 35 U.S.C. 104, together with a terminal disclaimer in accordance with 37 CFR 1.321(c). This rejection might also be overcome by showing that the reference is disqualified under 35 U.S.C. 103(c) as prior art in a rejection under 35 U.S.C. 103(a). See MPEP § 706.02(l)(1) and § 706.02(l)(2).

Claims 1-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Navab (US 5,923,727) in view of Asahina (US 5,539,798).

Regarding claims 1 and 7, Navab discloses an apparatus and method (Figs.2, 9 and 10), including:

a) an X-ray imaging system having a carrier support (C-arm) with an X-ray source and a radiation detector allowing an examination subject to be disposed between the X-ray source and the radiation detector,

b) a supporting arrangement (Fig.2) for the carrier support for moving the support relative to the examination subject for acquiring a series of 2D projections of the examination subject with the X-ray source and the radiation detector,

c) an optical 3D sensor 22 mounted to the carrier support, and

d) the supporting arrangement for the carrier support also moves the support relative to the examination subject for acquiring a 3D image dataset with the optical 3D sensor representing at least a portion of a surface of an object (optical phantom, see at least Fig.9).

Navab does not specifically disclose that the optical 3D image dataset is that of the examination subject. The image data set is of a phantom placed in a known spatial relationship with the examination subject.

Asahina specifically teaches the practice of taking an X-ray projection of an examination subject (with or without markers) and further using an optical sensor for acquiring an image dataset of the surface of the examination subject and superimposing the two (Figs.16 and 17C). The optical system directly images the examination subject surface for proper positioning of the system (Figs.4 and 6). Asahina images the examination subject directly for greater accuracy and precision, rather than relying upon additional, separate structures, such as the phantom of Navab, where additional errors can result due to imperfect positioning and measurement of that position relative to the examination subject.

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the image data sets of Navab to be of the surface of the examination subject, rather than the surface of a separate phantom, in order to improve the accuracy and precision of positioning and image superimposition, as shown by Asahina.

With respect to claims 2 and 8, Navab further discloses that the carrier support is a C-arm (Fig.2).

With respect to claims 3 and 9, Navab further discloses that the C-arm has a circumference, where the supporting arrangement moves the C-arm along the circumference during acquisition of the series of 2D projections (Figs.8 and 10).

With respect to claims 4 and 10, Navab further discloses that the supporting arrangement moves the C-arm through an angulation movement for acquiring the series of 2D projections (Figs.8 and 10).

With respect to claims 5 and 11, Navab further discloses that the C-arm and the supporting arrangement form an isocentric apparatus (see Figs.8 and 10).

With respect to claims 6 and 12, the Navab/Asahina combination has a computer 20 supplied with the series of 2D projections calculates a volume dataset of the body of the examination subject, and for combining the image dataset with the volume dataset by fusion (Fig.9 of Navab) or by superposition (Figs.16 and 17C of Asahina).

Response to Arguments

Applicant's arguments filed March 17th, 2006, with respect to the 35 USC 102(e) rejection over Suuronen have been fully considered and are persuasive. Therefore, the rejection has been withdrawn.

Applicant's arguments filed March 17th, 2006, with respect to the 35 USC 103(a) rejection over Navab in view of Asahina have been fully considered but they are not persuasive. Applicants argue that Navab does not have an optical 3D sensor nor develops a 3D image dataset with the optical sensor, and further, Applicants argue that the combination with Asahina is not proper since Navab teaches against imaging the patient for reducing radiation dose. The examiner respectfully disagrees.

First, the optical sensor of Navab performs the claimed function of acquiring the optical image data with movement of the carrier support. The optical sensor of Navab acquires 3D optical image datasets of the surface of an object, specifically, a pattern of markers on an optical phantom surface (Figs.4, 6, 9 and 10). The series of images (3D image dataset) taken through the process provide a 3D spatial definition of the location of the optical phantom, which is used for combination with the X-ray images by fusion.

Applicants further argue on this issue that the sensor system of Navab is only 2D since the cameras each take only 2D images, and further that the 3D information is contained in the marker arrangement of the phantom. It is true that each individual sensor of Navab takes 2D images. However, the practice of taking 2D images of the same object from different angles (with the disclosed multiple 2D sensors) inherently provides a 3D image dataset. Therefore, the combination of multiple 2D cameras provide an optical 3D sensor. Furthermore, the images are used to define 3D coordinates of the position of the object (Figs.9 and 10). And, as stated in the previous paragraph, the series of 2D images taken at each carrier support position provide a 3D dataset as well.

Regarding the concept that the phantom has predetermined spatial 3D relationships rather than the camera images, the examiner does not understand the distinction nor the significance of it. Further, the examiner does not agree that the claims require such a distinction. The spatial information used by Navab is derived from the optical images: these predetermined relationships are represented in the images, and therefore, the images represent 3D data. That's how the computer acquires the spatial information and uses it. The same is true of Asahina and Applicants' invention: the spatial information in the optical images is based upon the positions of objects in the image datasets, whether the objects in the images are markers or other optically useful features.

Second, Applicants argue that the teaching of Asahina to optically image the patient directly is in contradiction to the teachings of Navab, specifically that Navab teaches against unnecessary imaging of the patient due to radiation exposure. The examiner does not understand this line of reasoning, since the statement of obviousness discusses optical imaging, not X-ray imaging. Therefore, radiation dose to the patient is not an issue. The rejection is strictly directed to the "on-line" procedure of Navab, since this is the pertinent aspect of the prior art teachings. The claimed invention requires the acquisition of X-ray images, as well as optical images, of the patient, and there are no X-ray images of the patient being acquired during the "off-line" calibration procedure of Navab (no optical images of the patient, either).

Navab optically images an optical phantom during the X-ray imaging procedure of imaging the patient (Figs.9 and 10), and Asahina teaches the more common and simpler arrangement of optically imaging the patient directly during an X-ray imaging procedure of

imaging the patient. Asahina uses either markers or natural features in the images, for optical recognition for alignment/superposition purposes. Navab requires additional support structure to position one or more optical phantoms and also requires more computation time for relating the various coordinate systems (at least three: patient, the carrier support and at least one optical phantom). In the case of Asahina, there are only two coordinate systems: the carrier support and the patient, thus greatly simplifying the computation needs and reducing error.

Although Asahina teaches 2D optical image datasets, the teachings of imaging the patient directly are analogous for providing the obvious advantages set forth above, regardless of whether or not the resulting datasets are 2D or 3D. Therefore, Applicants' arguments are not persuasive, and the 35 USC 103(a) rejections over Navab in view of Asahina stand.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Colins (US 6,535,574 B1) and Cosman (Us 6,662,036 B2) teach the acquisition of optical 3D image datasets of the surface of a patient with a separately-mounted, stationary 3D optical image sensor.

Schmitz (US 6,050,724) and Simon (US 6,470,207 B1) teach 3D optical imaging of optical phantom-like structures for positioning purposes.

Postlethwaite (US 6,088,424) teaches PIP superposition of X-ray and optical images of a patient.

Suuronen (US 6,614,875 B2) and US Patents to Bani-Hashemi (US 6,229,873 B1 and US 6,447,163 B1) teach 2D imaging for alignment purposes.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thomas R. Artman whose telephone number is (571) 272-2485. The examiner can normally be reached on 9am - 5:30pm Monday - Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ed Glick can be reached on (571) 272-2490. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Thomas R. Artman
Patent Examiner

6/1/06

EDWARD J. GLICK
SUPERVISORY PATENT EXAMINER